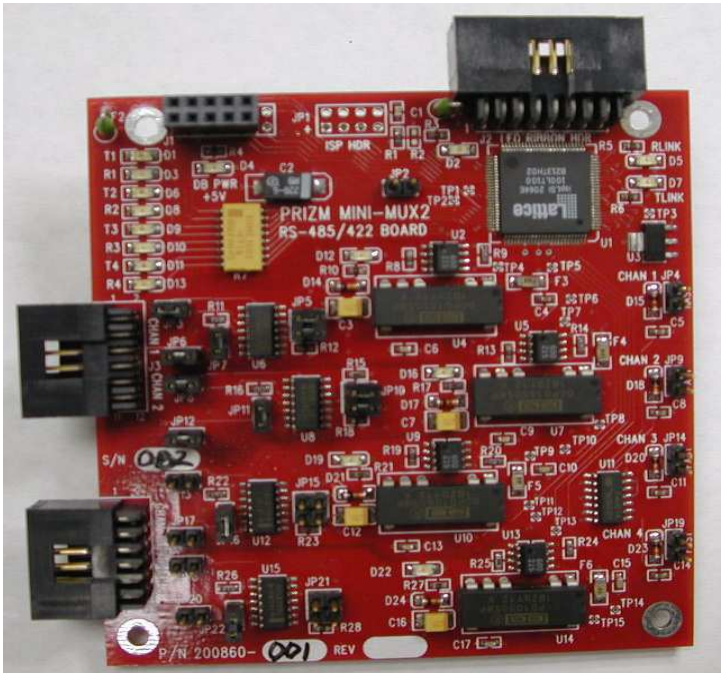
Mini-Mux 2 RS-422/485 Daughterboard

(200860-xxx)

User's Manual And

Troubleshooting Guide



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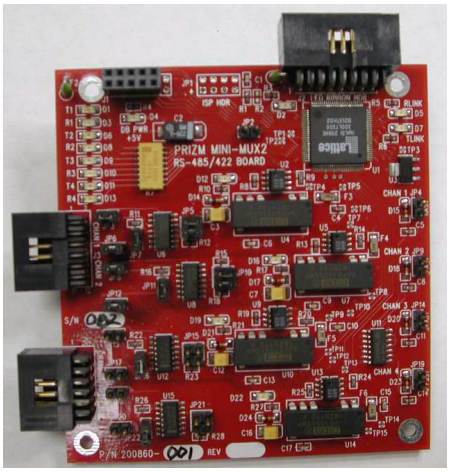
1 Mini-Mux2 RS-422/485 Daughterboard, Part Number 200860-xxx



The Mini-Mux 2 RS-422/485 daughterboard provides the user with an additional four independent RS-422 or RS-485 serial data channels. Each channel can also be independently configured for either RS-422 (4-wire) or RS-485 (2-wire) communications. Each channel is optically isolated, self-powered and transient protected.

The Mini-Mux2 RS-422/485 daughterboard connects to the Prizm Mini-Mux2 Video Input and Output boards via a 10 pin header (J1) located at the top left of the board. This header contains power pins(4), data pins(2), clock pins (2), a pin for monitoring link status and a pin for future use.

1.1 Mini-Mux2 RS-422/485 Daughterboard Revision History:

The MM2 RS-422/485 daughterboard has gone through the following printed circuit board (PCB) and Assembly revisions:

PCB Revision A/Assembly Revision A Original design.

1.2 Mini-Mux2 RS-422/485 Daughterboard Dash (-) Numbers*:*

The MM2 RS-422/485 daughterboard has a Dash Number appended to the part number. This Dash Number identifies the specific board configurations:

-001 configuration Original Configuration.

1.3 Mini-Mux2 RS-422/485 Daughterboard Operation:

A programmable logic device handles all timing and control functions on the daughterboard.
The programmable logic provides the direct connection of the daughterboard serial channels to the Mini-Mux 2 base boards via the daughterboard connector and then on to each of the 4 RS-422/485 serial channels.

The daughterboard connection runs at a clock rate of 16.0 or 16.6 MHz, depending in the link direction and the specific clocks placed on the MM2 boards. All four serial channels are time-sampled simultaneously at a rate of 2.0 or 2.075Msps (about 1/8 of the sampling rate). The maximum serial channel data rate is limited by the time sampling rate to approximately 660Kbps (about 1/3 of the sampling rate).

Each serial channel will support either an RS-422 (4-wire) or an RS-485 (2-wire) configuration by simply changing the appropriate jumper shunts. In the RS-422 configuration, any data rate up to about 660Kbps is supported. In the RS-485 configuration, any data rate up to about 660Kbps is also supported. For RS-485, the placement of a jumper shunt at the appropriate "FAST" jump post may be required if the baud rate exceeds 115Kbaud. Whether this shunt is or is not required is left to the user to determine based on his particular configuration and timing requirements of the RS-485 equipment.

There are two 12-pin polarized connectors for the four serial channels. The top left connector, J3, carries serial channels 1 and 2 while the bottom left connector, J4, carries serial channels 3 and 4.

The J3 connector has the following signals (RS-422 selected for both channels):

PIN	Signal	Signal Direction
1	T1-	OUTPUT
2	T1+	OUTPUT
3	GND_ISOA	ISOLATED GROUND
4	GND_ISOA	ISOLATED GROUND
5	R1-	INPUT
6	R1+	INPUT
7	T2-	OUTPUT
8	T2+	OUTPUT
9	GND_ISOB	ISOLATED GROUND
10	GND_ISOB	ISOLATED GROUND
11	R2-	INPUT
12	R2+	INPUT

Note1: Pin 1 is located on each connector at the top left side of each connector. Pins 1, 2, 11 and 12 are identified on the silk screen.

Note2: GND_ISOA is isolated from GND_ISOB. Pins 3 and 4 are connected together as are pins 9 and 10.

The J4 connector has the following signals (RS-422 selected for both channels):

PIN	Signal	Signal Direction
1	T3-	OUTPUT
2	T3+	OUTPUT
3	GND_ISOC	ISOLATED GROUND
4	GND_ISOC	ISOLATED GROUND
5	R3-	INPUT
6	R3+	INPUT
7	T4-	OUTPUT
8	T4+	OUTPUT
9	GND_ISOD	ISOLATED GROUND
10	GND_ISOD	ISOLATED GROUND
11	R4-	INPUT

12	R4+	INPUT

Note1: Pin 1 is located on each connector at the top left side of each connector. Pins 1, 2, 11 and 12 are identified on the silk screen.

Note2: GND_ISOC is isolated from GND_ISOD. Pins 3 and 4 are connected together as are pins 9 and 10.

The J3 connector has the following signals (RS-485 selected for both channels):

PIN	Signal	Signal Direction
1	RT1-	OUTPUT/INPUT
2	RT1+	OUTPUT/INPUT
3	GND_ISOA	ISOLATED GROUND
4	GND_ISOA	ISOLATED GROUND
5	RT1-	OUTPUT/INPUT
6	RT1+	OUTPUT/INPUT
7	RT2-	OUTPUT/INPUT
8	RT2+	OUTPUT/INPUT
9	GND_ISOB	ISOLATED GROUND
10	GND_ISOB	ISOLATED GROUND
11	RT2-	OUTPUT/INPUT
12	RT2+	OUTPUT/INPUT

The J4 connector has the following signals (RS-485 selected for both channels):

PIN	Signal	Signal Direction
1	RT3-	OUTPUT/INPUT
2	RT3+	OUTPUT/INPUT
3	GND_ISOC	ISOLATED GROUND
4	GND_ISOC	ISOLATED GROUND
5	RT3-	OUTPUT/INPUT
6	RT3+	OUTPUT/INPUT
7	RT4-	OUTPUT/INPUT
8	RT4+	OUTPUT/INPUT
9	GND_ISOD	ISOLATED GROUND
10	GND_ISOD	ISOLATED GROUND
11	RT4-	OUTPUT/INPUT
12	RT4+	OUTPUT/INPUT

1.3.1 Mini-Mux 2 RS-422/485 Daughterboard Indicators and Controls:

There are several surface mount diagnostic status LEDs on this board.

The SMD LEDs are meant for board level troubleshooting but may be of some limited use to the user in diagnosing a problem. The SMD LEDs are as follows:

D4 - labeled "DB PWR +5V"
- ON if +5VDC is present on board (from MM2 main board)

D2 - not labeled
- ON if +5VDC is available on LED Ribbon Header (J2)
- ON if fuse F1 is good

D5 - labeled "RLINK"
- ON if the board is receiving a high-speed link from the other RS-422/485 daughterboard at the other end of the fiber link

D7 - labeled "TLINK"
- ON if the board is transmitting a high-speed link to the other RS-422/485 daughterboard at the other end of the fiber link

Note: The TLINK LED will always be ON. The RLINK LED will blink off during board power-up but then stay on constantly.

The following LEDs are used to indicate RS-422/485 data traffic status:

D1 - labeled "T1"
- ON if RS-422/485 data is being transmitted out of channel 1.

D3 - labeled "R1"
- ON if RS-422/485 data is being received into channel 1.

D6 - labeled "T2"
- ON if RS-422/485 data is being transmitted out of channel 2.

D8 - labeled "R2"
- ON if 422/485 data is being received into channel 2.

D9 - labeled "T3"
- ON if 422/485 data is being transmitted out of channel 3.

D10 - labeled "R3"
- ON if 422/485 data is being received into channel 3.

D11 - labeled "T4"
- ON if 422/485 data is being transmitted out of channel 4.

D13 - labeled "R4"
- ON if 422/485 data is being received into channel 4.

SWITCHES: There are no switches on the RS-422/485 daughterboard.

CONNECTORS: The connectors on the RS-422/485 daughterboard are as follows:

J1: Daughterboard Connector

VDC Supply	1 o	o 2	VDC Supply
RXD 4	3 o	o 4	TXD 4
GROUND	5 o	o 6	GROUND
RXC	7 o	o 8	TXC
RCV LINK	9 o	o 10	Future

J2 LED Display Ribbon Header Connector

GROUND	1 o	o 2	+5VDC
LINK_LED	3 o	o 4	TLINK_LED
RCV_LINK_LED	5 o	o 6	FUTURE_LED
R1_LED	7 o	o 8	T1_LED
R2_LED	9 o	o 10	T2_LED
R3_LED	11 o	o 12	T3_LED
R4_LED	13 o	o 14	T4_LED
GROUND	15 o	o 16	+5VDC

J3: Channels 1 and 2 Data Connector:

T1- (RT1-)	1 o	o 2	T1+ (RT1+)
GND_ISOA	3 o	o 4	GND_ISOA
R1- (RT1-)	5 o	o 6	R1+ (RT1+)
T2- (RT2-)	7 o	o 8	T2+ (RT2+)
GND_ISOB	9 o	o 10	GND_ISOB
R2- (RT2-)	11 o	o 12	R2+ (RT2+)

Note: The first signal label is for RS-422 while the signal label in parentheses is for RS-485.

J4: Channels 3 and 4 Data Connector:

T3- (RT3-)	1 o	o 2	T3+ (RT3+)
GND_ISOC	3 o	o 4	GND_ISOC
R3- (RT3-)	5 o	o 6	R3+ (RT3+)
T4- (RT4-)	7 o	o 8	T4+ (RT4+)
GND_ISOD	9 o	o 10	GND_ISOD
R4- (RT4-)	11 o	o 12	R4+ (RT4+)

Note: The first signal label is for RS-422 while the signal label in parentheses is for RS-485.

JUMPERS: There are 21 jumper posts sets on the Mini-Mux 2 RS-422/485 daughterboard: (PIN 1 DENOTED BY SQUARE PCB PAD)

JP1: ISP Programming Header

JP2: For Future Use

2 o o 1

JP3: Channel 1 RS-485/RS-422 Selection (T1+ to R1+ connection)

1 o==o 2 RS-485 or 1 o o 2 RS-422

JP4: Channel 1 RS-485 FAST Data Rate Select

1 o 1 o

Slow Rate or | Fast Rate

2 o 2 o

JP5: Channel 1 RS-422/485 Configuration Selection

4 o==o 3 RS-485 or 1 o o 3 RS-422

2 o==o 1 2 o o 1

JP6: Channel 1 RS-485/RS-422 Selection (T1- to R1- connection)

1 o==o 2 RS-485 or 1 o o 2 RS-422

JP7: Channel 1 RS-422/485 Receiver Termination Enable

2 o 2 o

Unterminated or | Terminated

1 o 1 o

JP8: Channel 2 RS-485/RS-422 Selection (T2+ to R2+ connection)

1 o==o 2 RS-485 or 1 o o 2 RS-422

JP9: Channel 2 RS-485 FAST Data Rate Select

1 o 1 o

Slow Rate or | Fast Rate

2 o 2 o

JP10: Channel 2 RS-422/485 Configuration Selection

4 o==o 3 RS-485 or 1 o o 3 RS-422

2 o==o 1 2 o o 1

JP11: Channel 2 RS-422/485 Receiver Termination Enable

2 o 2 o

Unterminated or | Terminated

1 o 1 o

JP12: Channel 2 RS-485/RS-422 Selection (T2- to R2- connection)

1 o==o 2 RS-485 or 1 o o 2 RS-422

JP13: Channel 3 RS-485/RS-422 Selection (T3+ to R3+ connection)

1 o==o 2 RS-485 or 1 o o 2 RS-422

JP14: Channel 3 RS-485 FAST Data Rate Select

```
1 o                          1 o
      Slow Rate    or          |   Fast Rate
2 o                          2 o
```

JP15: Channel 3 RS-422/485 Configuration Selection

```
  4 o==o 3  RS-485     or     1 o  o 3 RS-422
  2 o==o 1                    2 o  o 1
```

JP16: Channel 3 RS-422/485 Receiver Termination Enable

```
2 o                          2 o
      Unterminated   or        |   Terminated
1 o                          1 o
```

JP17: Channel 3 RS-485/RS-422 Selection (T3- to R3- connection)

```
  1 o==o 2  RS-485     or     1 o  o 2 RS-422
```

JP18: Channel 4 RS-485/RS-422 Selection (T4+ to R4+ connection)

```
  1 o==o 2  RS-485     or     1 o  o 2 RS-422
```

JP19: Channel 4 RS-485 FAST Data Rate Select

```
1 o                          1 o
      Slow Rate    or          |   Fast Rate
2 o                          2 o
```

JP20: Channel 4 RS-485/RS-422 Selection (T4- to R4- connection)

```
  1 o==o 2  RS-485     or     1 o  o 2 RS-422
```

JP21: Channel 4 RS-422/485 Configuration Selection

```
  4 o==o 3  RS-485     or     1 o  o 3 RS-422
  2 o==o 1                    2 o  o 1
```

JP22: Channel 4 RS-422/485 Receiver Termination Enable

```
2 o                          2 o
      Unterminated   or        |   Terminated
1 o                          1 o
```

1.3.2 Mini-Mux 2 RS-422/485 Daughterboard Specifications:

Number of serial channels:	4 x RS-422 or RS-485
Connector type:	12-pin AMP
Data rates supported:	up to 660Kbps
Isolation provided:	optical, self-powered

1.3.3 Mini-Mux 2 RS-422/485 Daughterboard Dimensions:

PC/104 printed circuit board (PCB): 3.55 in x 3.775 in x 0.60 in board-to-board

(90.17 mm x 95.88 mm x 15.24 mm)

1.3.4 Mini-Mux 2 RS-422/485 Daughterboard Power Requirements:

The board requires +5VDC at 250 milliamps. It is powered off of the Mini-Mux 2 Video Input or Output board via a daughterboard connector. A 2Amp through-hole fuse (F2) is provided to protect the board from inadvertent electrical shorts. A 2Amp through-hole fuse (at F1) is provided to protect the board from shorts on the LED ribbon header (J2).

1.4 RS-422/485 Daughterboard Installation and Checkout

To properly check out the MM2 RS-422/485 daughterboard, the user must have at two PCs with RS-232 to RS-422 (and/or RS-485) boards installed and operational. These PCs must be correctly configured to communicate via a serial port and have the appropriate serial bit error rate tester (BERT) or terminal-emulator software installed. Verify that the PCs can communicate between themselves by attaching them together directly with a short electrical test cable. Once you are sure your test network is operational follow these steps to insert the Prizm System into your network and to prove that the Prizm System is correctly carrying the serial data traffic.

1. Install the Mini-Mux 2 boards with the daughterboard in your system.
2. Install the appropriate fiber optic cables between the Mini-Mux 2 optics.
3. Power up the Mini-Mux2 Surface Video Out and Vehicle Video In cards.
4. Verify that all boards power up correctly and show the appropriate status LED indications.
5. Verify that the Mini-Mux 2 main boards are linked via the fiber cables and that no optical errors are being reported.
6. With no RS-422 and/or RS-485 cables attached to either of the Mini-Mux 2 RS-422/485 daughterboards, verify that both boards have the top right two LEDs lit (RLINK and TLINK) and the top left LED lit (DB PWR +5V).
7. Plug the RS-422 and/or RS-485 cables from two of the test PCs into the appropriate serial connectors (J3 or J4) on each board.
8. Attempt to run the serial test communications from one test PC to another test PC. The serial test program should show that there is communications between the PCs and the error rate.

1.5 Mini-Mux2 RS-422/485 Daughterboard Troubleshooting

In normal operation the following LED status should be observed with the RS-422/485 daughterboard plugged into MM2 main board with no RS-422 and/or RS-485 cables attached:

1.5.1 DC Power Troubleshooting

The SMD LEDs are as follows:

D4 – ON (DB PWR +5V)

D5 – On (RLINK)

D7 – On (TLINK)

The remaining LEDs will be off.

The LED status conditions of the RS-422/485 daughterboard are detailed for several scenarios assuming two test PCs. The statuses are as follows:

1.5.2 RS-422 Channel Troubleshooting

For this troubleshooting, it is assumed that all 4 serial channels are configured for RS-422 operation on both the "Local" and "Remote" RS-422/485 daughterboards.

1. Ensure that the Prizm Mini-Mux 2 system is fully functional and a PC that is running a serial communications program (i.e. terminal or hyperterminal) is plugged into RS-422 channel 1 of the "Local" RS-422/485 daughterboard. A loop-back cable is plugged into the "Remote" RS-422/485 daughterboard data header to loop RS-422 data back to the "Local" RS-422/485 daughterboard set:

At the "Local" end (with the PC connected and serial data being generated):
RLINK LED (D5)- ON green solid
TLINK LED (D7)- ON green solid
T1 LED (D1) - ON red or blinking ON with RS-422 traffic from "Remote" end
R1 LED (D3) - ON green or blinking ON with RS-422 traffic into board
T2 LED (D6) - OFF
R2 LED (D8) - OFF
T3 LED (D9) - OFF
R3 LED (D10) - OFF
T4 LED (D11) - OFF
R4 LED (D13) - OFF

At the "Remote" end:
RLINK LED (D5)- ON green solid
TLINK LED (D7)- ON green solid
T1 LED (D1) - ON red or blinking ON/OFF with RS-422 traffic from "Local" end
R1 LED (D3) - ON green or blinking ON/OFF with RS-422 traffic (looped back)
T2 LED (D6) - OFF
R2 LED (D8) - OFF
T3 LED (D9) - OFF
R3 LED (D10) - OFF
T4 LED (D11) - OFF
R4 LED (D13) - OFF

2. Now move the data cable connection from RS-422 channel 1 to channels 2, 3 and then 4. Also move the loop-back cable follow the channel under test. The same LED statuses should be observed as above except moved from channel 1 to 2 to 3 and then to 4, as appropriate.

1.5.3 RS-485 Channel Troubleshooting

For this troubleshooting, it is assumed that all 4 serial channels are configured for RS-485operation on both the "Local" and "Remote" RS-422/485 daughterboards.

Note: A PC that is running a serial communications program (the host) that supports RS-485 (i.e. the Prizm PMON program, for example) and a slave PC or stand-alone computer that communicates with the RS-485 program (i.e. the Prizm Modem 2 board with Diagnostics) must be employed to test an RS-485 channel.

1. Ensure that the Prizm Mini-Mux 2 system is fully functional and a host PC is plugged into the RS-485 channel 1 of the "Local" RS-422/485 daughterboard and a slave computer is plugged into the RS-485 channel 1 of the "Remote" RS-422/485 daughterboard data header.

At the "Local" end (with the host PC connected and running):

RLINK LED (D5)- ON green solid
TLINK LED (D7)- ON green solid
T1 LED (D1) - ON red or blinking ON with RS-485 traffic from "Remote" end
R1 LED (D3) - ON green or blinking ON with RS-485 traffic into board
T2 LED (D6) - OFF
R2 LED (D8) - OFF
T3 LED (D9) - OFF
R3 LED (D10) - OFF
T4 LED (D11) - OFF
R4 LED (D13) - OFF

At the "Remote" end:

RLINK LED (D5)- ON green solid
TLINK LED (D7)- ON green solid
T1 LED (D1) - ON red or blinking ON/OFF with RS-485 traffic from "Local" end
R1 LED (D3) - ON green or blinking ON/OFF with RS-485 traffic (looped back)
T2 LED (D6) - OFF
R2 LED (D8) - OFF
T3 LED (D9) - OFF
R3 LED (D10) - OFF
T4 LED (D11) - OFF
R4 LED (D13) - OFF

2. Now move the data cable connections from RS-485 channel 1 to channels 2, 3 and then 4. The same LED statuses should be observed as above except moved from channel 1 to 2 to 3 and then to 4, as appropriate.